



PACOM S&T Conference

5 March 2013

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**Assistant Secretary of Defense for
Research and Engineering (Acting)**

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*“Gentleman, we are out of money.
Now we must think!”*



Winston Churchill to
Parliament during World War II

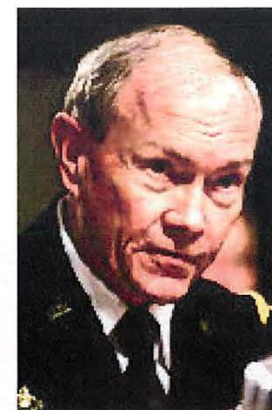
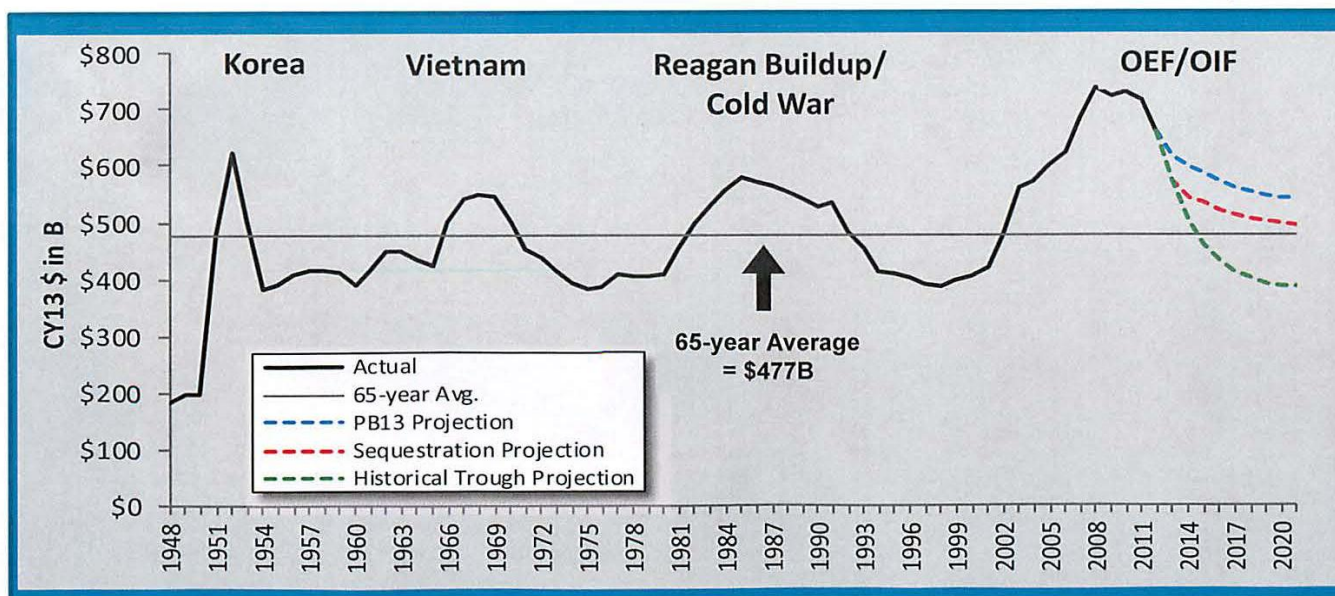


The Reality....

"Our current security challenges are more formidable and complex than those we faced in downturns following Korea, Vietnam, and the Cold War. There is no foreseeable "peace dividend" on our horizon."

GEN DEMPSEY, CJCS

Testimony to SASC, 12 Feb 2013



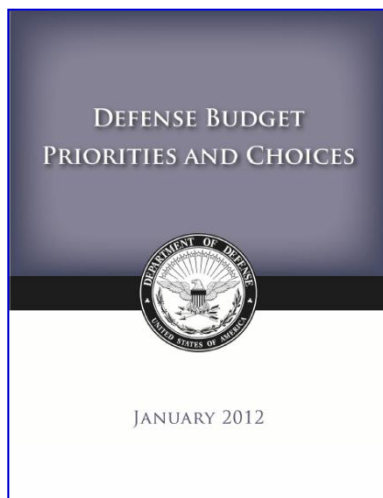
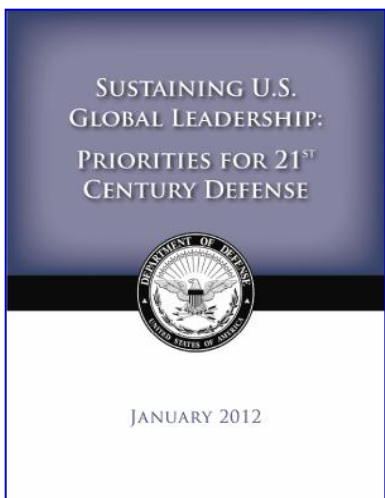
UNCLASSIFIED



Key Elements of Defense Strategic Guidance



- The military will be smaller and leaner, but it will be agile, flexible, ready and technologically advanced.
- Rebalance our global posture and presence to emphasize Asia-Pacific and the Middle East.
- Build innovative partnerships and strengthen key alliances and partnerships elsewhere in the world.
- Ensure that we can quickly confront and defeat aggression from any adversary – anytime, anywhere.
- Protect and prioritize key investments in technology and new capabilities, as well as our capacity to grow, adapt and mobilize as needed.



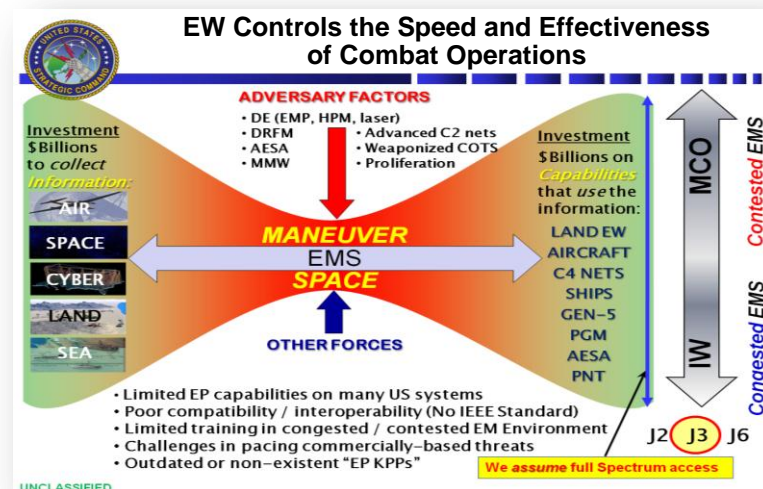
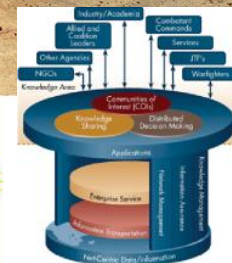


Defense S&T Drivers



In time of budget uncertainty, need to reevaluate the purpose of Defense S&T:

- Mitigate emergent threats, e.g.
 - Electronic Warfare and Digital radio frequency memory (DRFM)
 - Missile defense
 - Cyber
- Build / engineer affordability / interoperability in the acquisition chain
 - Multi-service platforms pass data /info
 - Extend life and capabilities of existing systems
- Create technology surprise, e.g.
 - Quantum information systems
 - Synthetic biology, etc

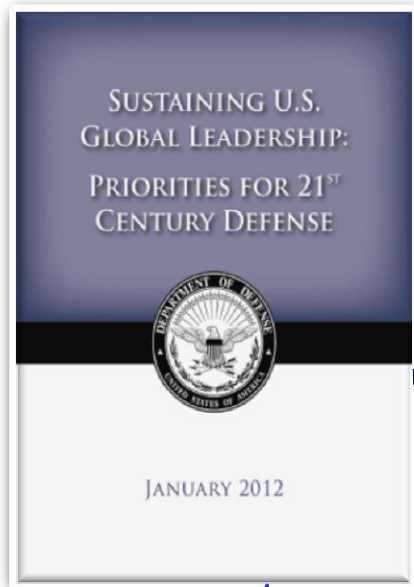




Priorities for 21st Century Defense

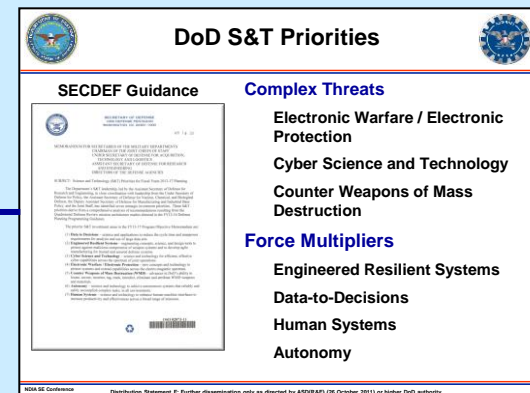


Primary Missions of the U.S. Armed Forces



Defend the Homeland and Provide Support to Civil Authorities
Counter Terrorism and Irregular Warfare
Conduct Stability and Counterinsurgency Operations
Provide a Stabilizing Presence
Deter and Defeat Aggression
Project Power Despite Anti-Access / Area Denial Challenges
Counter Weapons of Mass Destruction
Operate Effectively in Cyberspace and Space
Conduct Humanitarian, Disaster, Relief and Other Operations
Maintain a Safe, Secure and Effective Nuclear Deterrent

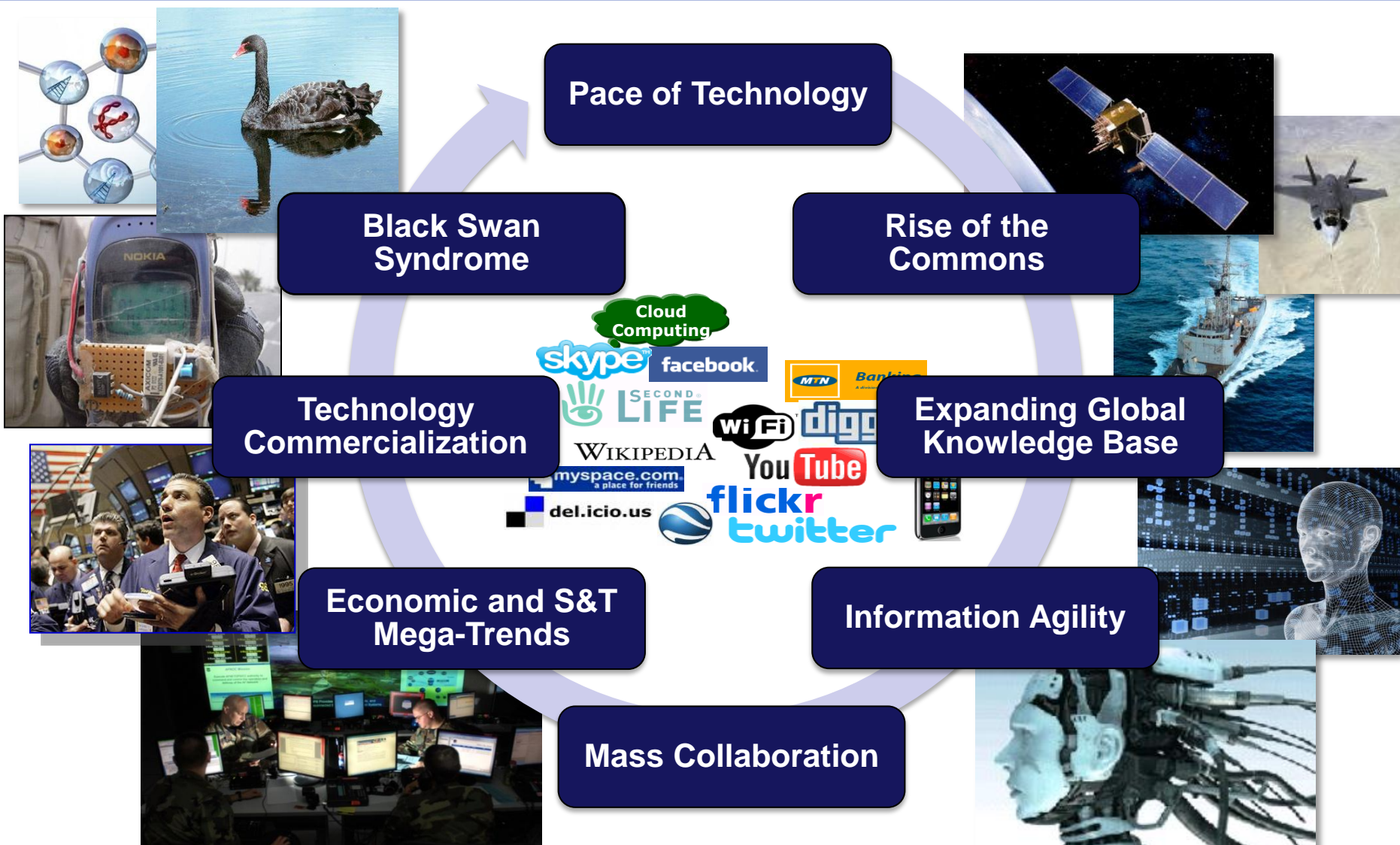
S&T Focus Areas



- Counter AA/AD capabilities
- Tailored and adaptive capabilities
- Low-cost, Small-footprint operations
- Developing and integrating partnership capabilities



A New Reality: *Global Dimensions Affect DoD S&T*

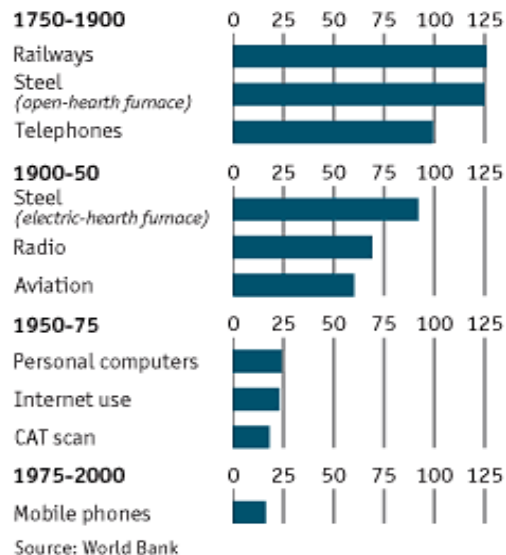




Pace of Technology

High-tech leapfrog

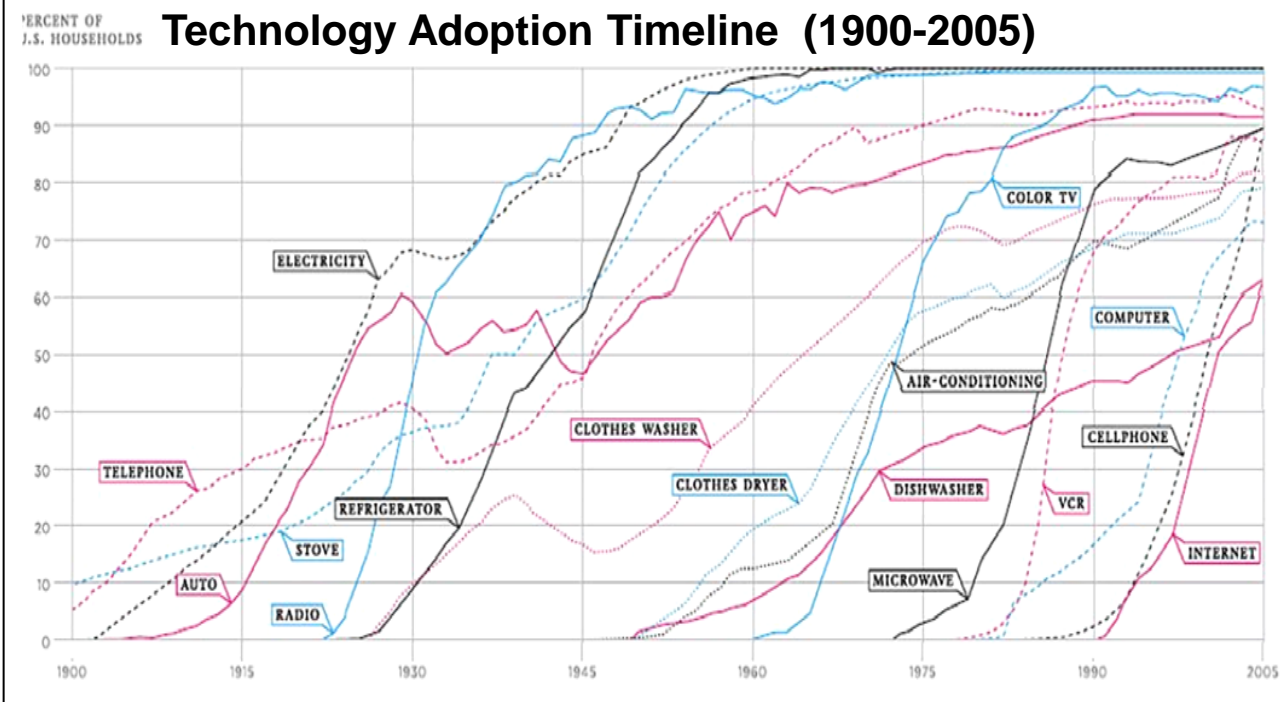
Number of years after invention for selected technologies to reach 80% country coverage



The Economist, Feb. 9, 2008

It took 23 years to go from modeling germanium semiconductor properties to a commercial product

The carbon nanotube was discovered in 1991; recognized as an excellent source of field-emitting electrons in 1995, and commercialized in 2000



The Pace of Technology Development and Market Availability is Exceeding the Pace of Acquisition



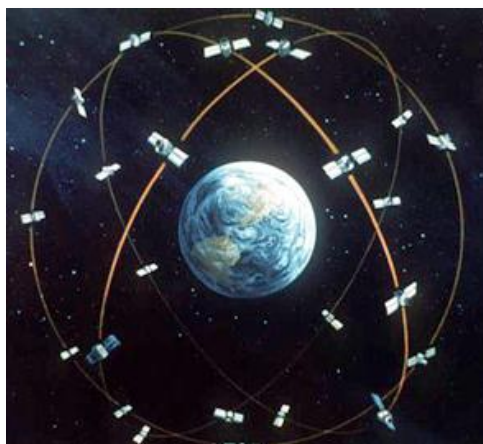
Rise of the Commons



Electronic Warfare



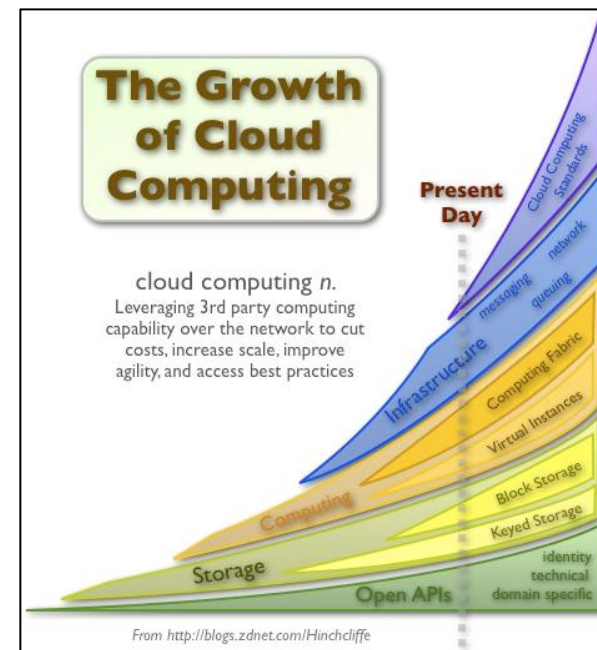
Oceans



Space



Cyber



Ubiquitous Data

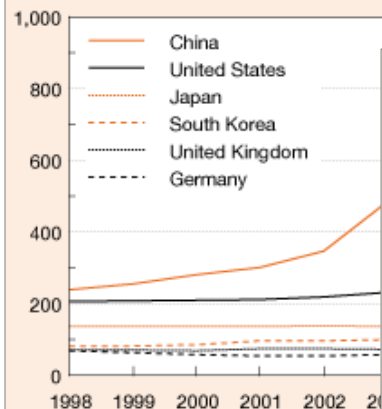
Military Operations Increasingly Depend on Being Able to Operate in Places “No One Owns” – *The Commons*



Expanding Global Knowledge Base

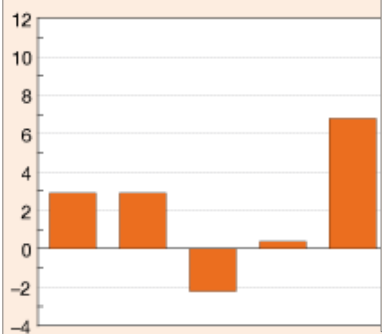
First university degrees in natural sciences and engineering, selected countries: 1998-2006

Thousands



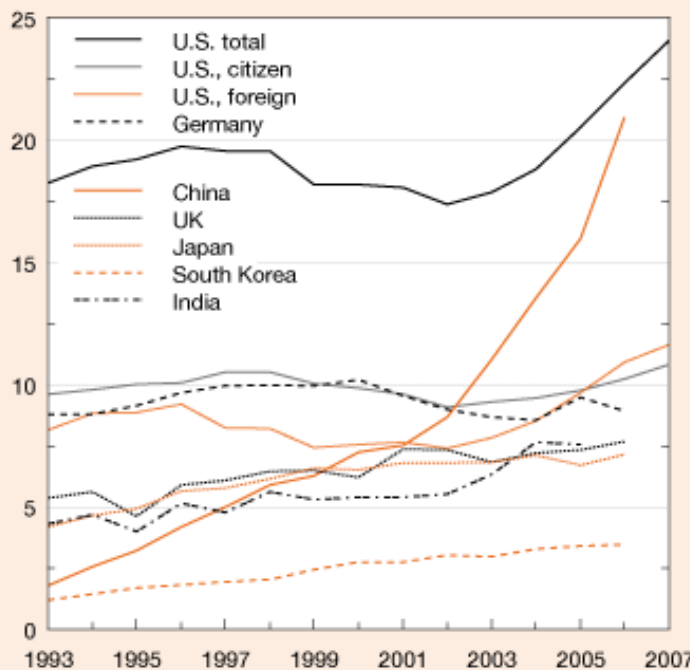
Average annual growth in number of selected regions/countries/economies

Percent

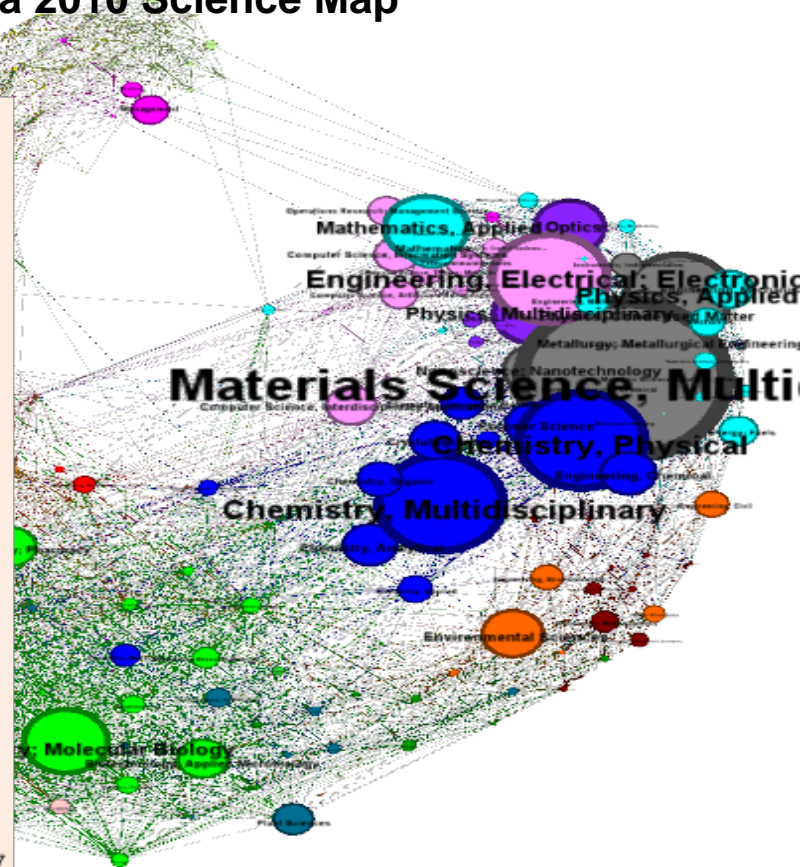


Doctoral degrees in natural sciences and engineering, selected countries: 1993-2007

Thousands



China 2010 Science Map

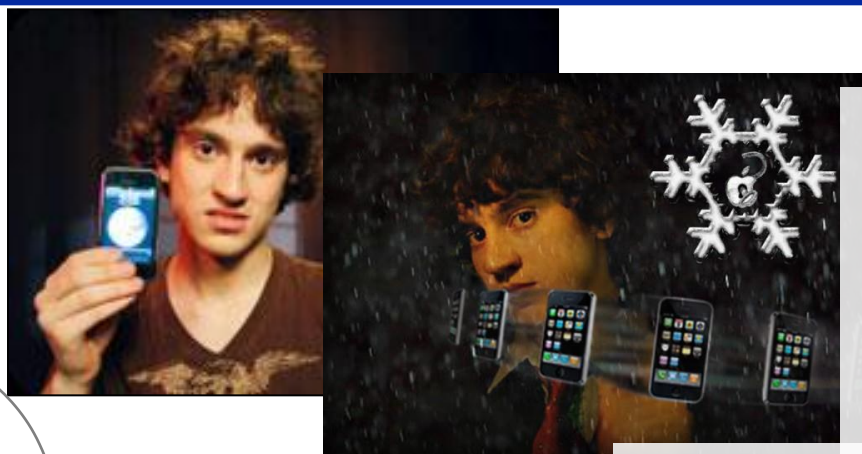


The Research Talent Base is Growing and Shifting at an Accelerating Rate

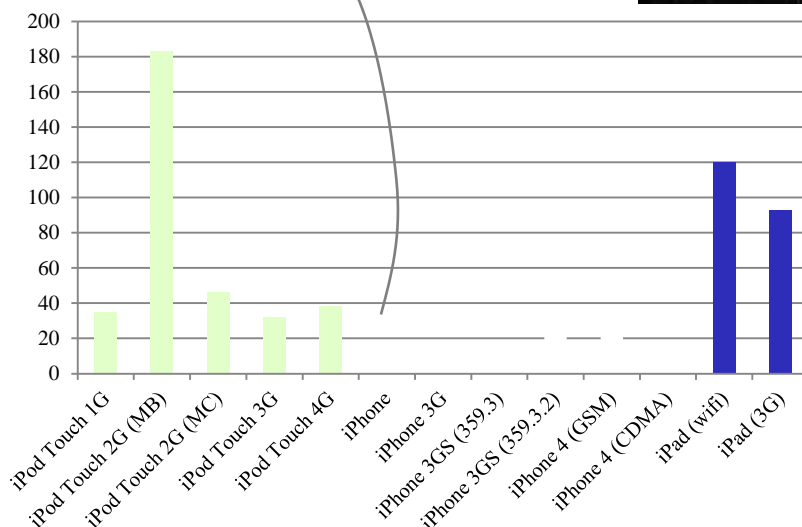


Information Agility

Apple and AT&T released the iPhone on 29 June in an exclusive agreement. Hotz spent ~500 hours working on his "summer project" and the hack was available in July.



Days to Break



Conventional Warfare Response loop measured in years

USAF Capability

High Altitude Aircraft



Electronic Countermeasures



Endgame Countermeasures

Adversary Capability



High Altitude SAM



Monopulse SAM



SAM with ECCM

Counter-Insurgency Warfare Response loop measured in weeks

US Capability

Jammers



Mine Resistant Ambush Protected (MRAP)



Adversary Capability



Advanced Technology

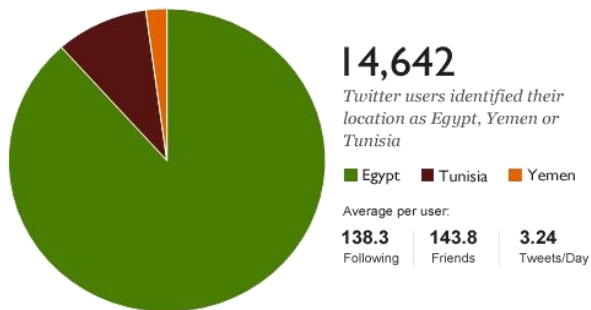
Today's adversaries are light and agile, and rapidly react and innovate in response to US actions.

This is the New Asymmetry—Victory Goes to the Agile and Innovative

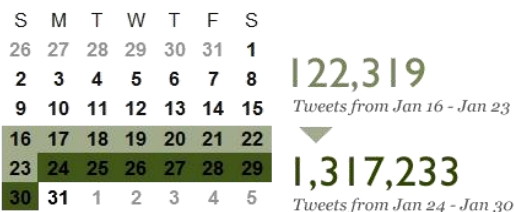


Mass Collaboration

Crisis in Egypt, Tunisia & Yemen



Rise of crisis related tweets



30.2 MILLION NUMBER OF SOCIAL MEDIA USERS IN THE MIDDLE EAST



15 MILLION OF THEM ON FACEBOOK



5.5 MILLION TOTAL TWITTER USERS IN THE REGION

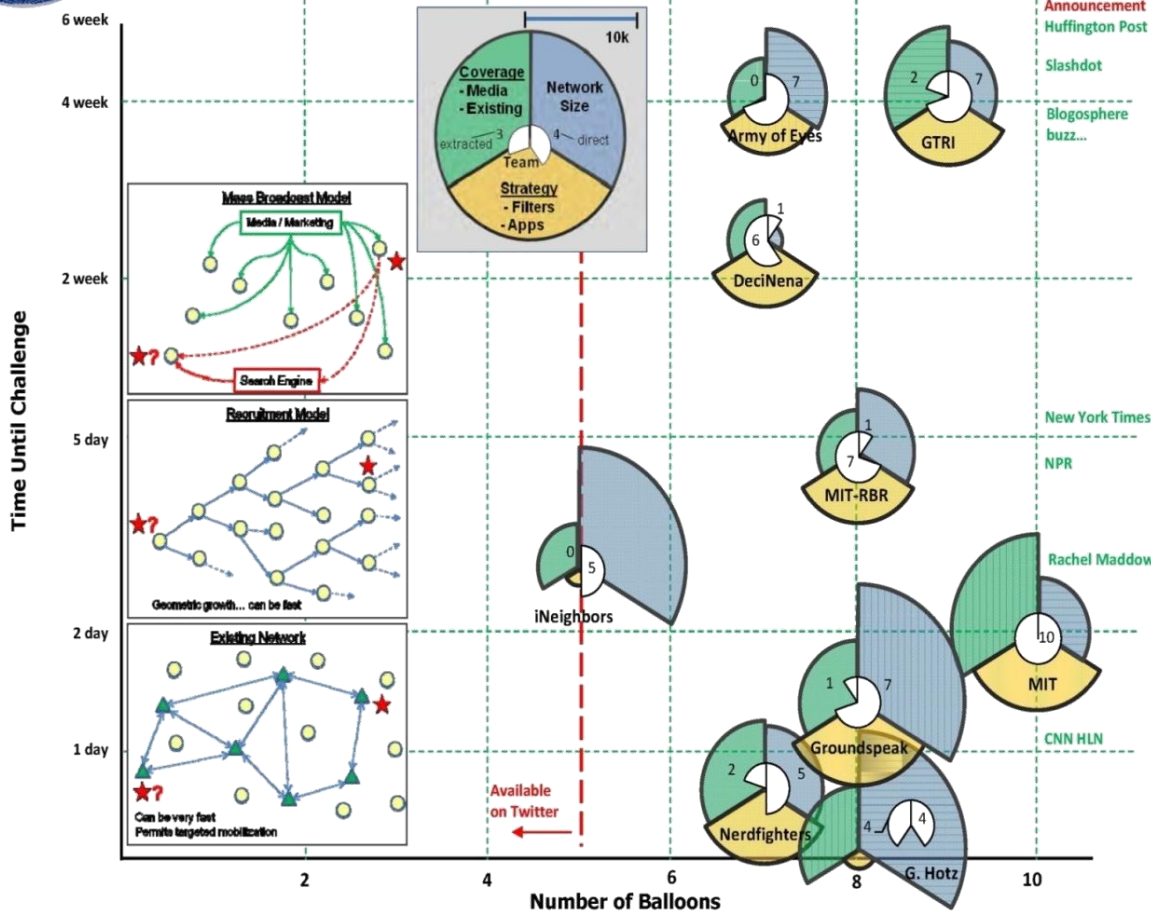


40% OF THEM FROM THE UAE

240% INCREASE IN SAUDI ARABIA'S NUMBER OF TWITTER USERS IN 2010



Network Challenge Team Performance



Defense Advanced Research Projects Agency (DARPA)
2009 Network Challenge

Ad-hoc Groups Can Quickly Solve (or Create) Massively-Complex Problems



The Span of DoD R&E



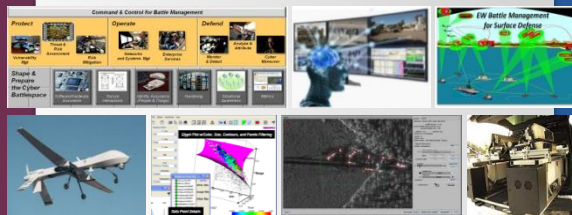
Near Term

Specific potential
adversary system
performance



Mid Term

Strategic force
development plans



Far Term

Understanding
investment in research
coupled with
assessment of potential
adversary capabilities



Prepare for an Uncertain Future

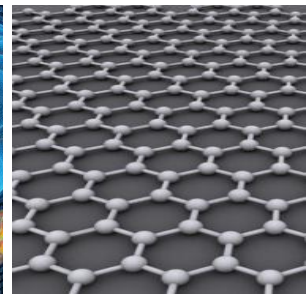
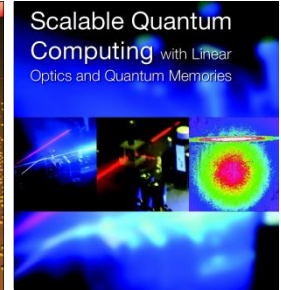


Basic Research Program



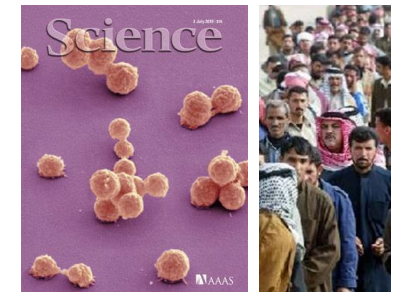
High Priority S&T areas for DoD

- Metamaterials and Plasmonics
- Quantum Information Science
- Cognitive Neuroscience
- Nanoscience and Nanoengineering
- Synthetic Biology
- Understanding Human and Social Behavior



Trends in basic research are identified and judged through a variety of interactions, including:

- Publications, university site visits, conference attendance
- Future Directions Workshops (identifying emerging areas for investment and International Centers of Excellence for collaborative opportunities)
- Engage expert panels (JASONS, National Academy of Sciences, etc...)



Understanding and Creating the Cutting Edge

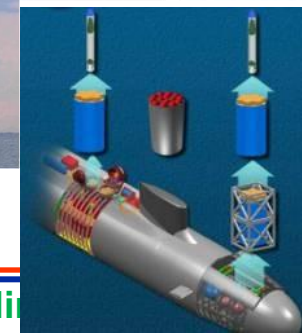
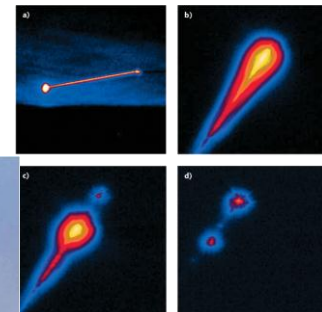
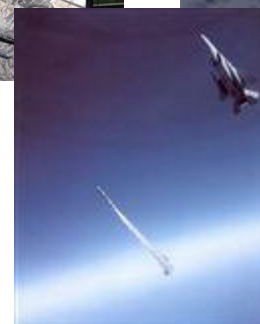


Anti-Access/ Area Denial

Current A2/AD Priorities

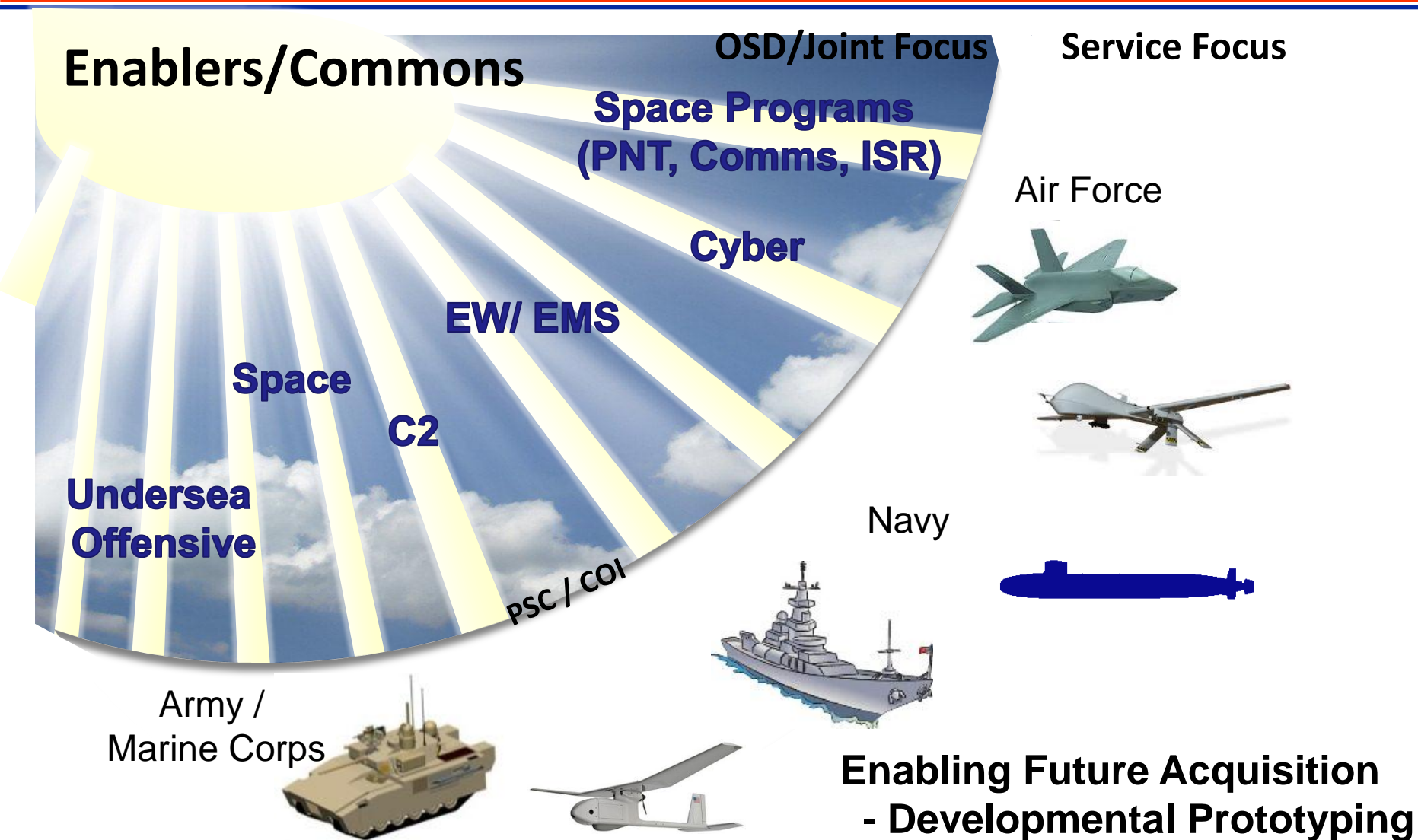


- **Electronic Attack / Electronic Protection**
- **Cyber Operations**
- **Space / Counter Space**
- **Undersea Operations**
- **Counter Missile / Missile Defense**
- **Counter Integrated Air Defense Systems**





DoD S&T Budget Focus



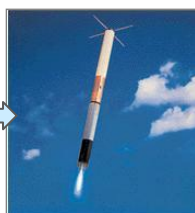
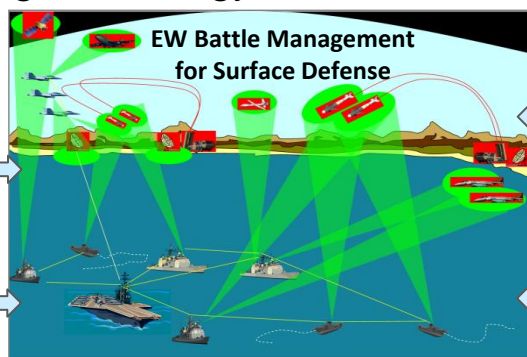


DoD S&T Complex Threats



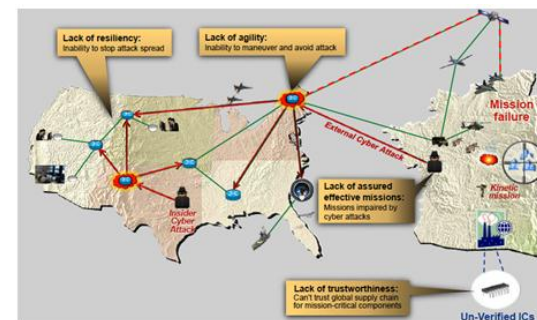
Electronic Warfare & Protection

- RF/Mixed Signal Component Technologies
- EO/IR Component Technologies
- Underlying technology enablers



Cyber Science and Technology

- Assuring Effective Missions
- Resilient Infrastructure Trust
- Cyber Experimentation & Measurement
- Agile Operations



Counter Weapons of Mass Destruction

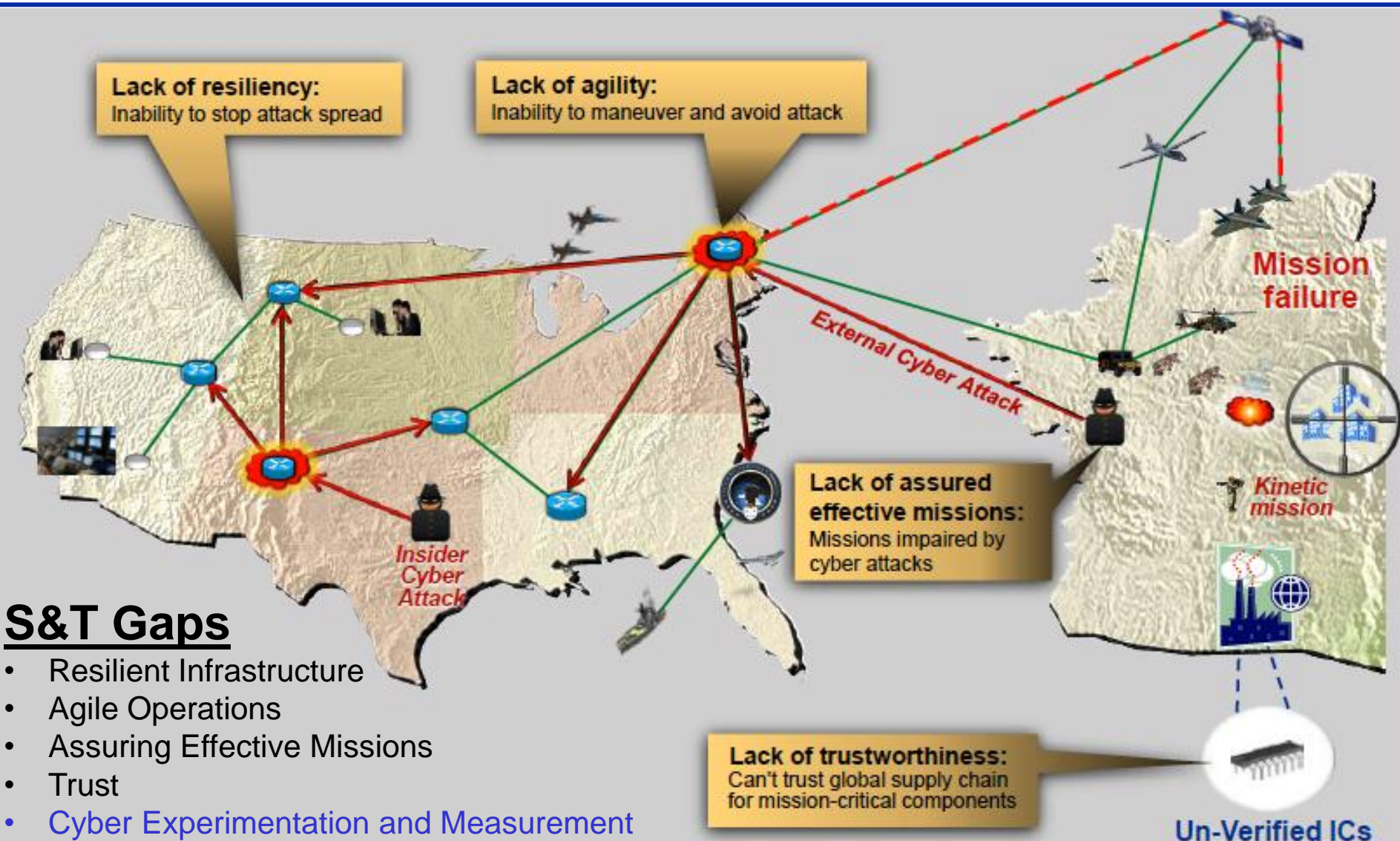


New concepts and technology for remote identification of nuclear, chemical, and biological material, and to assist in mitigation, containment, and attribution of the materials

- Broad Area Search
- Persistent Monitoring
- Tagging and Tracking



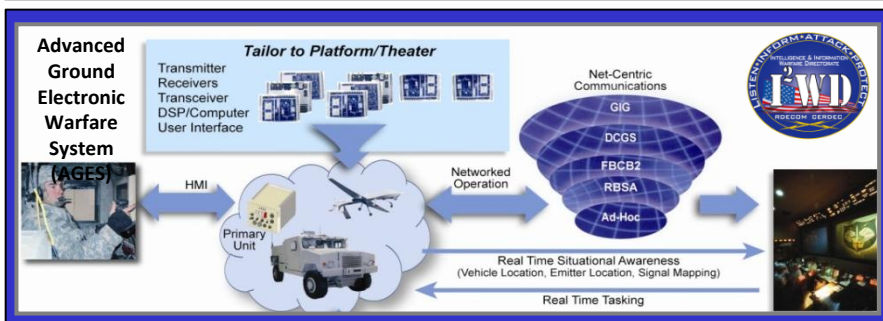
Cyber PSC – Problem Statement





Electronic Warfare Vision

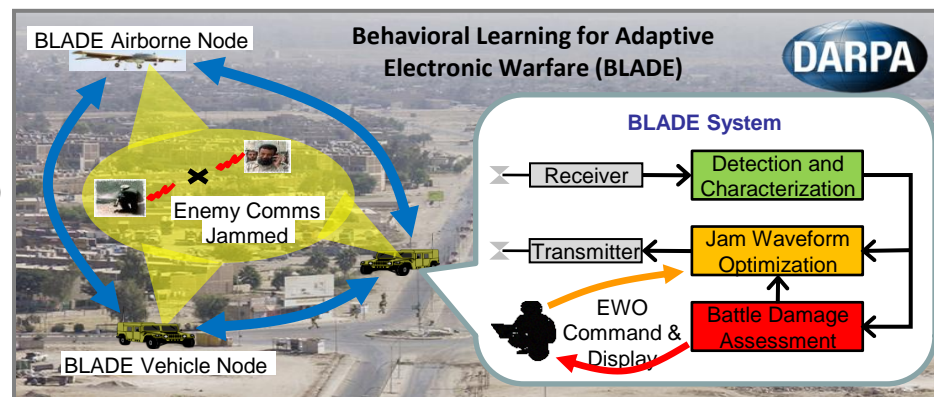
Electromagnetic Spectrum Dominance



S&T Gaps

- **RF/Mixed Signal Component Technologies**
 - Agile, high dynamic range receiver electronics
 - Agile, wideband transmitter electronics
 - Affordable/modular agile beam antennas
- **EO/IR Component Technologies**
 - Next generation multispectral IR Focal Plane Arrays (FPAs)
 - Multispectral, high power lasers
 - Multispectral optics & optical phase control
- **Underlying technology enablers**
 - Nitride semiconductor family (GaN/InN/AlN)
 - Ultra-precision clocks/oscillators (nsec → psec → fsec)

The Goal of Electronic Warfare is to Advantage U.S. and Coalition Force Operations by “Shaping” the Electromagnetic Spectrum (EMS)





Defense Innovation Marketplace



defenseinnovationmarketplace.mil

Website devoted to making it easier for you to find out about DoD's S&T and Program Investments



Links to Relevant DoD Information

- S&T Planning Documents
- Key Briefs from Department Leaders
- Doing Business with DoD, e.g.
 - Broad Agency Announcements
 - Industry Day Announcements
 - Rapid Innovation Fund Information
 - Links to Army, AF, Navy Labs



And Other DoD Agencies

HOME

RESOURCES

FAQs

NEWS

ABOUT IR&D

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Connecting Industry with Government Customers

The Defense Innovation Marketplace is a centralized online resource to better connect industry with government customers to invigorate innovation.

For Industry, the Marketplace is the place to learn about Department of Defense investment priorities and capability needs, and comply with the new [Defense Federal Acquisition Supplement \(DFARs\) rule](#).

For Government, the Marketplace will provide new search tools to assess and then leverage industry technology projects for current and future programs.

NEW IN THE MARKETPLACE

S&T Strategic Documents

- [Active Denial Technology \(ADT\)](#)
- [Joint Non-Lethal Weapons Program Overview](#)
- [DoD Mobile Device Strategy](#)

Doing Business with DoD

- [Army, Navy, & OSBP FY12 Rapid Innovation Fund BAAs Announced](#)
- [Air Force Information](#)
- [Other DoD Agencies Information](#)
- [Navy Information](#)

[More...](#)

News & Events

- [Updated FAQs and Answers Added](#)
- [2011 Rapid Innovation Fund Awards](#)
- [S&T Bulletin](#)

[More...](#)

Updated July 25

Resources

Useful DoD and Service information for business and program planning [here](#)

Industry

Market Your Innovation to DoD Customers [here](#)

Government

Find Details about Industry's Innovation Projects [here](#)



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Summary



- **DoD S&T aligned to meet priorities for a 21st Century security environment**
- **DoD Strategic Framework..... lays the foundation for S&T commitments – 7 Priority S&T Areas**
- **Federal Deficit Reduction will impact; S&T remains steady priority**
- **Asia-Pacific rebalance is the foundation of our R&E strategy**



Backup Slides